IS 6365 (1971): Laboratory electric ovens [ETD 32: Electrical Appliances]

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IS : 6365 - 1971
(Reaffirmed 2001)

Indian Standard

SPECIFICATION FOR LABORATORY ELECTRIC OVENS

Fourth Reprint AUGUST 2004

(Incorporating Amendment No. 1)

UDC 542·44 : 662·9

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 4 *September* 1972

AMENDMENT NO. 2 AUGUST 1977

TO

IS : 6365-1971 SPECIFICATION FOR LABORATORY ELECTRIC OVENS

Alterations

(*Page* 10, *clause* **9.2.4.1**, *lines* 5 *and* 6) — Substitute '0·5°C' for '0·3°C'.

(*Page* 11, *clause* **9.3.1**) — Substitute the following for the existing clause:

'**9.3.1** *Visual Examination and Inspection*

9.3.1.1 The laboratory electric ovens shall be visually examined and inspected for obvious visual defects in respect of components, parts and their assembly, construction, stability, marking, provision of suitable terminals for supply connections, earthing and the effectiveness of screws and connections.

9.3.1.2 The supply connections shall be of size appropriate to the rating (*see* **20** of IS : 302-1973*).

9.3.1.3 The external surface finish shall be even and free from finishing defects.'

(ETDC 43)

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AMENDMENT NO. 3 OCTOBER 1978
TO
IS : 6365-1971 SPECIFICATION FOR LABORATORY ELECTRIC OVENS

Alteration

(*Page* 6, *clause* **5.5.0**) — Delete.

Addenda

(*Page* 12, *clause* **9.3.7**) — Add the following new clauses after **9.3.7**:

'**9.3.8** *Temperature Recovery Test* — The oven shall be operated at a steady cut-out temperature of 10°C below the declared maximum operating temperature. The oven door shall then be opened fully for one minute without switching off the supply. On closing the door the original operating temperature shall be regained within 1°C in not more than 20 minutes.

9.3.9 *Test for Heating-Up Time* — The oven shall be connected to the supply with the thermostat set at its maximum point and any other control such as heat switches, ventilators, etc, adjusted according to the instructions of the manufacturer. The oven temperature shall reach the maximum operating value within 45 minutes of the connection of the supply.

9.3.10 *Test for Temperature-Rise*

9.3.10.1 The tests for compliance with **10.1** of IS : 302-1973* shall be performed as prescribed in **41** of IS : 302-1973*.

9.3.10.2 The temperature-rise of the external enclosure of the oven shall be measured after the oven has been adjusted to maximum operating temperature and is made to operate at this temperature for 3 hours. The temperature shall be measured at different points on the enclosure which, however, are not within 70 mm of any exhaust air vent from the oven. The maximum temperature observed at any point on the external enclosure shall be taken into account for calculating the temperature-rise. The temperature-rise so calculated shall not exceed 40°C.'

(*Page* 12, *foot-note*) — Add the following new foot-note:

'*General and safety requirements for household and similar electrical appliances (*fourth revision*).'

(ETDC 43)

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AMENDMENT NO. 4 MARCH 1995
TO
IS 6365 : 1971 SPECIFICATION FOR LABORATORY ELECTRIC OVENS

[This amendment is being issued to make reference to IS 302-1(1979) Safety of household and similar electrical appliances : Part 1 General requirements (*fifth revision*) in place of IS : 302-1973 General and safety requirements for household and similar electrical appliances (*fourth revision*).]

(*Designation and title of IS : 302-1973*) — Substitute 'IS 302-1(1979)' *for* 'IS : 302-1973' and 'Safety of household and similar electrical appliances : Part 1 General requirements (*fifth revision*)' *for* 'General and safety requirements for household and similar electrical appliances (*fourth revision*)' wherever they appear in the standard.

(*Page* 5, *clause* **3.1**) — Substitute '**5.1** of IS 302-1 (1979)' *for* '**3.1** of IS : 302-1973'.

(*Page* 5, *clause* **3.2**) — Substitute '**5.2** of IS 302-1 (1979)' *for* '**3.2** of IS : 302-1973'.

[*Page* 5, *clause* **4.1** (*see also Amendment* No. 1)] — Substitute '**24** of IS 302-1 (1979)' *for* '**5, 7.11 and 7.12** of IS : 302-1973'.

(*Page* 5, *clause* **5.1**, *line* 1) — Substitute '**22** of IS 302-1(1979)' *for* '**7** of IS : 302-1973'.

(*Page* 6, *clause* **5.4.1**, *line* 2) — Substitute 'IS 3854 : 1988*' *for* 'IS : 3854-1966*'.

(*Page* 6, *clause* **5.5.0**) — Substitute 'IS 4165 : 1991†' *for* 'IS : 4165 - 1967†'.

(*Page* 6, *foot-notes*) — Substitute the following for the existing foot-notes:

'*Specification for switches for domestic and similar purposes (*first revision*)

†Specification for thermostats for general purpose electric ovens (*first revision*)'

(*Page* 7, *clause* **5.6**, *line* 3) — Substitute 'IS 3588 : 1987†' *for* 'IS : 3588 - 1967'.

(*Page* 7, *clause* **5.7**, *line* 1) — Substitute 'IS 2480 (Part 1) : 1983‡ and IS 2480 (Part 2) : 1983‡' *for* 'IS : 2480-1964‡'.

Amend No. 4 to IS 6365 : 1971

(*Page* 7, *clause* **6.2**, *line* 1) — Substitute '**11** of IS 302-1(1979)' *for* '**10.1** of IS : 302-1973'.

(*Page* 7, *clause* **6.3**, *line* 1) — Substitute '**13** of IS 302-1(1979)' *for* '**11** of IS : 302-1973'.

(*Page* 7, *clause* **6.4**, *line* 1) — Substitute '**20** of IS 302-1(1979)' *for* '**14.2** of IS : 302-1973'.

(*Page* 7, *clause* **6.5**, *line* 1) — Substitute '**21** of IS 302-1(1979)' *for* '**15** of IS : 302-1973'.

(*Page* 7, *clause* **6.6**, *line* 1) — Substitute '**25** of IS 302-1(1979)' *for* '**20** of IS : 302-1973'.

(*Page* 7, *clause* **6.7**, *line* 1) — Substitute '**26** of IS 302-1(1979)' *for* '**21** of IS : 302-1973'.

(*Page* 7, *foot-notes with* '†' *and* '‡' *marks*) — Substitute the following for the existing foot-notes:

'†Specification for electric axial flow fans (*first revision*).

‡Specification for general purpose glass thermometers:

Part 1 Solid stem thermometers (*second revision*)'.

Part 2 Enclosed scale thermometers (*second revision*).'

(*Page* 8, *clause* **6.8**, *line* 1) — Substitute '**27** of IS 302-1(1979)' *for* '**22** of IS : 302-1973'.

(*Page* 8, *clause* **6.9**, *line* 1) — Substitute '**28** of IS 302-1(1979)' *for* '**23** of IS : 302-1973'.

[*Page* 8, *clause* **6.10**, *line* 1 (*see also Amendment No.* 1)] — Substitute '**31** of IS 302-1(1979)' *for* '**7.33** of IS : 302-1973'.

(*Page* 8, *clause* **7.1**, *line* 1) — Substitute '**10.1** of IS 302-1(1979)' *for* '**9.1** of IS : 302-1973'.

(*Page* 8, *clause* **8.1**, *line* 2) — Substitute '**7** of IS 302-1(1979)' *for* '**25.1** of IS : 302-1973'.

[*Page* 9, *clause* **9.1.2** (*see also Amendment No.* 1)] — Substitute the following for the existing clause:

'**9.1.2** *Acceptance Tests* — The following shall constitute the acceptance tests:

a) Visual examination and inspection (*see* **9.3.1**),

b) Protection against electric shock [*see* **8** of IS 302-1(1979)],

c) High voltage [*see* **13.3** of IS 302-1(1979)],

d) Insulation resistance (dry) [*see* **16.3** of IS 302-1(1979)],

e) Leakage current [*see* **13.2** of IS 302-1(1979)],

f) Earthing connection [*see* **27** of IS 302-1(1979)],

g) Input [*see* **10** of IS 302-1(1979)],

h) Temperature limit [*see* **11** of IS 302-1(1979)],

j) Temperature variation (*see* **9.3.2**),

k) Temperature differential (*see* **9.3.3**),

m) Temperature overshoot (*see* **9.3.6**), and

n) Resistance to fire [*see* **30.2** of IS 302-1(1979)].

[*Page* 9, *clause* **9.1.3** (*see also Amendment No.* 1)] — Substitute the following for the existing clause:

'**9.1.3** *Routine Tests* — The following shall constitute the routine tests:

a) Visual examination and inspection (*see* **9.3.1**),

b) Protection against electric shock [*see* **8** of IS 302-1(1979)],

c) High voltage [*see* **13.3** of IS 302-1(1979)],

d) Insulation resistance (dry) [*see* **16.3** of IS 302-1(1979)], and

e) Earthing connection [*see* **27** of IS 302-1(1979)].

(*Page* 9, *clause* **9.2.1**, *line* 1 (*see also Amendment No.* 1)] — Substitute '**4.6** of IS 302-1(1979)' *for* '**26.3** of IS : 302-1973'.

Amend No. 4 to IS 6365 : 1971

(*Page* 11, *Table* 1 (*see also Amendment No.* 1)] — Substitute the following for the existing table:

Table 1 Schedule of Tests

Sl No.	Tests	Clause reference
1.	Visual examination and inspection	9.3.1
2.	Resistahce to heat and fire	30.2
3.	Mechanical strength	21
4.	Protection against electric shock	8
5.	High voltage	13.3
6.	Insulation resistance (dry)	16.3
7.	Leakage current	13.2
8.	Earthing connection	27
9.	Input	10
10.	Temperature limit	11
11.	Temperature variable	9.3.2
12	Temperature differential	9.3.3
13.	Temperature drift	9.3.4
14.	Reproducibility of temperature setting	9.3.5
15.	Temperature overshoot	9.3.6
16.	Ventilation rate (for low temperature ovens and wide range ovens intended for drying)	9.3.7
17.	Temperature recovery test	Under consideration
18.	Heating of Time	Under consideration

[*Page* 11, *clause* **9.3.1.2** (*see Amendment No.* 2)] — Substitute the following for the existing clause:

'**9.3.1.2** The supply connection shall be of size appropriate to the rating [*see* **25** of IS 302-1(1979)].'

[*Page* 12, *clause* **9.3.10.1** (*see Amendment No.* 3)] — Substitute the following for the existing clause:

'**9.3.10.1** The tests shall be performed as prescribed in 11 of IS 302-1(1979).'

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TO
IS 6365 : 1971 SPECIFICATION FOR LABORATORY ELECTRIC OVENS

(*Page* 5, *clause* **5.2.3**, *line* 6) — Substitute '30 percent' *for* '70 percent'.

(*Page* 8, *clause* **9.1.1**, *line* 2) — Substitute '2 samples' *for* '5 samples'.

(ETD 32)

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(*Page* 11, *Table* 1 (*see also Amendment No.* 1)] — Substitute the following for the existing table:

Table 1 Schedule of Tests

Sl No.	Tests	Clause reference

'9.3.1.2 The supply connection shall be of size appropriate to the rating [*see* 25 of IS 302-1(1979)].'

[*Page* 12, *clause* **9.3.10.1** (*see Amendment No.* 3)] — Substitute the following for the existing clause:

'**9.3.10.1 The tests shall be performed as prescribed in 11 of IS 302-1(1979).**'

(ETD 32)

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Indian Standard

SPECIFICATION FOR LABORATORY ELECTRIC OVENS

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Indian Standard

SPECIFICATION FOR LABORATORY ELECTRIC OVENS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 18 November 1971 after the draft finalized by the Electrical Appliances Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard covers the general, safety and performance requirements for electrically heated ovens intended mainly for laboratory use, with a view to ensuring personal safety against electric shock, safety against the effects of excessive temperature and fire, and reliable operation.

0.3 IS : 302-1967* to which references have been made in this standard with regard to general and safety requirements as well as methods of test is a necessary adjunct to this standard. Should, however, any deviation exist between the requirements of IS : 302-1973* and those of this standard, provisions of the latter shall apply.

0.4 This standard is one of a series of Indian Standards on electrical appliances.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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1. SCOPE

1.1 This standard applies to thermostatically controlled electrically heated ovens intended for laboratory use and designed for connections to supplies at voltages not exceeding 250V ac single phase 50 Hz or dc, having an

*General and safety requirements for household and similar electrical appliances (*fourth revision*).

†Rules for rounding off numerical values (*revised*).

internal space up to 250 litres and ventilated by convection with or without internal fans to assist the circulation of air.

1.2 This standard does not apply to infra-red or radiant heat ovens, vacuum or pressure ovens, constant-humidity ovens and forced-draught ovens.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 **Oven** — A closed heating chamber in which heat from the source is transferred to the load predominantly by convection.

2.2 **Low-Temperature Oven** — An oven designed for heating materials at temperatures up to 110°C principally used for removal of moisture.

2.3 **Medium Temperature Oven** — An oven designed to heat materials up to 200°C.

2.4 **High Temperature Oven** — An oven designed to heat materials above 200°C.

2.5 **Wide Range Oven** — An oven which incorporates the features of the ovens described in 2.2 to 2.4.

2.6 **Convection Oven** — An oven in which temperature uniformity is brought about by convection resulting solely by the difference in density between hot air and cold air.

2.7 **Forced Convection Oven** — An oven in which motorized fan is used to assist the convection and bring about uniformity of temperature.

2.8 **Working Space** — The space within the oven which is above the lowest shelf, if provided, and not less than 50 mm from any heating surface or 30 mm from any non-heating surface of a roof, wall, partition or cover.

2.9 **Oven Temperature** — The mean of the temperature of air at the centre of the working space at a cut-in of the thermostat and at the cut-out immediately following.

2.10 **Temperature Variation** — The difference in the temperature of the air at the centre of the working space and at any other point in the working space at any instant.

2.11 **Temperature Differential** — The cyclic change of temperature at any point in the working space, regulated by the operation of the thermostat.

2.12 Temperature Drift — The change in oven temperature which may take place in continuous operation over a long period.

2.13 Temperature Overshoot — The amount by which the maximum temperature attained by air at the centre of the working space during the initial heating up, exceeds the oven temperature when steady operating condition of the thermostat is reached.

3. RATING

3.1 Voltage Rating — The provisions of **3.1** of IS : 302-1973* shall apply.

3.2 Rated Input — The provisions of **3.2** of IS : 302-1973* shall apply.

4. MATERIALS AND COMPONENTS

4.1 The provisions of **5**, **7.11** and **7.12** of IS : 302-1973* shall apply.

5. CONSTRUCTION

5.1 The relevant provisions of **7** of IS : 302-1973* shall apply in addition to the requirements specified in **5.2** to **5.7**.

5.2 Cabinet

5.2.1 The inner surface of the cabinet and its fittings shall be smooth and impervious, and any point, rendering or coating used on the interior shall be capable of withstanding the maximum temperature for which the oven is designed.

5.2.2 Ventilation of the cabinet shall be provided by means of one or more ports near the bottom and the top of the cabinet. In large cabinets circulating fans may be provided to assist convection and ventilation so that temperature variation is kept within limits. The circulating fan shall not protrude into the working space. The ports at the top of the cabinet shall be adjustable to regulate ventilation.

5.2.3 Shelves, if provided, shall be adjustable along the height and made of stout wire mesh, expanded metal or perforated sheet metal, and shall be adequately protected from corrosion by heat and humidity. The design of lugs, brackets or runners for shelves shall be such that heavily laden shelves may not tilt during withdrawal. The area of all the opening or holes in the shelves shall not aggregate to less than 70 percent of the total area of the shelves.

5.2.4 The ovens shall be either of the totally-enclosed type or provided with a suitable viewing arrangement.

*General and safety requirements for household and similar electrical appliances (*fourth revision*).

5.3 Heating Elements — The heating element shall be so designed and located that overheating in its vicinity is minimized. The heating element or that part of it which is fixed on the inside bottom of the oven shall be covered by suitable baffles or perforated covers so that fresh air entering through the bottom ports is preheated and uniformaly distributed in the working space, and undue heating of materials at the bottom of the working space is avoided.

5.4 Wiring and Components — The wiring and components used in an oven shall be constructed or fixed in such a manner that they shall be able to withstand continuously the temperature to which they are likely to be exposed when the oven working space is maintained at its designed maximum temperature.

5.4.1 *Switches* — Manually operated switches, if used, in an oven shall comply with IS : 3854-1966*. Switches and controls shall be so located or protected that they are not subjected to mechanical injury and spillage.

5.5 Thermostats

5.5.0 The thermostats used shall comply with the provisions of IS : 4165-1967† in addition to those given in **5.5.1** to **5.5.7**.

5.5.1 An indicator lamp shall be provided to indicate the functioning of the thermostat.

5.5.2 The thermostat contacts, if any, and the contacts of any auxiliary device, such as relay or contactor, shall be readily accessible for inspection, cleaning or replacement, by the removal of a simple cover retained by one or more screws.

5.5.3 If a mercury switch is used in a thermostat or in an auxiliary device, it shall be securely mounted and protected so that it is not easily damaged in normal handling or transport of the oven.

5.5.4 If the thermostat contacts are slow acting a condenser of sufficient capacity shall be connected across them to prevent excessive arcing and to minimize radio interference.

5.5.5 If the stem, bulb, or other sensitive part of the thermostat is fixed in or protrudes into the working space, it should be adequately protected from accidental damage during loading or unloading the oven.

5.5.6 If the thermostat adjusting screw, knob or other adjusting device is exposed to unintentional or accidental disturbance of setting, a scale shall be provided to check the setting.

*Specification for switches for domestic and similar purposes.
†Specification for thermostats for general purpose electric ovens.

5.5.7 The external provision for adjustment of temperature shall be such that any desired temperature within the range of an oven may be attained within the appropriate accuracy given below:

Oven	*Accuracy*
	°C
Low temperature	± 0·25
Medium temperature	± 0·5
High temperature Wide temperature	± 1

5.6 Electric Fans (Applicable to Forced Convection Ovens Only) — Electric fans for use with alternating current supply shall comply with IS : 2312-1967* and IS : 3588-1967†.

5.7 Thermometer — A suitable thermometer conforming to IS : 2480-1964‡ and capable of reading temperatures with the desired accuracy shall be provided on the oven. Alternately arrangement shall be provided for fixing such a thermometer on the cabinet so that its sensitive element is well within the working space.

6. GENERAL AND SAFETY REQUIREMENTS

6.1 Protection Against Electric Shock — The provisions of **8** of IS : 302-1973§ shall apply.

6.2 Temperature Limit — The provision of **10.1** of IS : 302-1973§ shall apply.

6.2.1 The temperature rise of the external enclosure of the laboratory oven shall not exceed 40 °C.

6.3 Electrical Insulation — The provisions of **11** of IS : 302-1973§ shall apply.

6.4 Stability — The provisions of **14.2** of IS : 302-1973§ shall apply.

6.5 Mechanical Strength — The provisions of **15** of IS : 302-1973§ shall apply.

6.6 Supply Connections - The provisions of **20** of IS : 302-1973§ shall apply.

6.7 Terminals — The provisions of **21** of IS : 302-1973§ shall apply.

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*Specification for propeller type ac ventilating fans (*first revision*).

†Specification for electric axial flow fans.

‡Specification for general purpose glass thermometers.

§General and safety requirements for household and similar electrical appliances (*fourth revision*).

6.8 Earthing — The provisions of 22 of IS : 302-1973* shall apply.

6.9 Screws and Connections — The provisions of 23 of IS : 302-1973* shall apply.

6.10 Resistance to Rusting — The provisions of 7.33 of IS : 302-1973* shall apply.

7. PERFORMANCE REQUIREMENTS

7.1 Input — The provisions of 9.1 of IS : 302-1973* shall apply.

7.2 Thermal Performance — The oven shall satisfactorily pass the tests specified in 9.

8. MARKING AND INSTRUCTIONS FOR USE

8.1 Each oven shall be marked indelibly and clearly with the information prescribed in 25.1 of IS : 302-1973* on its outer surface or on a label firmly attached thereto.

8.1.1 The ovens may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

8.2 Marking of Earth Terminal — The symbol '⏚' shall be marked prominently on or adjacent to the earth terminal, if provided.

8.3 Instructions for Use — Each oven shall be provided with the necessary instructions including precautions to be taken for its proper use. If the thermostat has adjustments for altering its range or sensitivity, the instructions for carrying out such adjustments shall also be included.

9. TESTS

9.1 Categories of Tests

9.1.1 *Type Tests* — The tests specified in Table 1 shall constitute type tests and shall be carried out on 5 samples of ovens of the same model rating (selected preferably at random from a regular production lot).

*General and safety requirements for household and similar electrical appliances (*fourth revision*).

9.1.1.1 *Criteria of acceptance* — All samples shall successfully pass all the type tests for proving conformity with the requirements of the standard. If any sample should fail in any of the type tests, the testing authority at its discretion may call for fresh samples not exceeding twice the original number and subject them again to all the tests or to the tests in which failure occurred. No single failure shall be permitted in repeat test(s).

9.1.2 *Acceptance Tests* — The following shall constitute the acceptance tests:

a) Visual examination and inspection (*see* **9.3.1**),
b) Protection against electric shock (*see* **40** of IS : 302-1973*),
c) High voltage (*see* **42.3** of IS : 302-1973*),
d) Insulation resistance (dry) (*see* **44.3** of IS : 302-1973*)
e) Leakage current (*see* **42.1** to **42.2** of IS : 302-1973*),
f) Earthing connection (*see* **38** of IS : 302-1973*),
g) Input (*see* **45** of IS : 302-1973*),
h) Temperature limit (*see* **41** of IS : 302-1973*),
j) Temperature variation (*see* **9.3.2**),
k) Temperature differential (*see* **9.3.3**), and
m) Temperature overshoot (*see* **9.3.6**).

9.1.2.1 A recommended sampling procedure for acceptance test is specified in Appendix C of IS . 302-1973*.

9.1.3 *Routine Tests* — The following shall constitute routine tests:

a) Visual examination and inspection (*see* **9.3.1**),
b) Protection against electric shock (*see* **40** of IS : 302-1973*),
c) High voltage (*see* **42.3** of IS : 302-1973*),
d) Insulation resistance (dry) (*see* **44.3** of IS : 302-1973*), and
e) Earthing connection (*see* **38** of IS : 302-1973*).

9.2 General Conditions for Tests

9.2.1 *Test Voltage* — The provisions of **26.3** of IS : 302-1973* shall apply.

9.2.2 *Ambient Temperature* — The ambient temperature during the performance test may be kept at any value between 15 to 40°C and during the test the temperature shall not vary by more than ± 5°C.

*General and safety requirements for household and similar electrical appliances (*fourth revision*).

9.2.3 *Test Temperatures* — The temperature variation test and temperature differential test shall be carried at 100 ± 5°C for low temperature ovens, and at a temperature within 10°C of the maximum temperature for medium and high temperature ovens. In the case of wide range ovens these tests shall be done at 100 ± 5°C, as well as at a temperature within 10°C of its maximum temperature. The temperature drift test and the temperature overshoot test shall be made at the mid-point of the temperature range of the oven. The ventilation rate test (applicable only to low temperature ovens or wide-range ovens which are also intended for drying) shall be carried out at 105 ± 2°C.

9.2.4 *Measurement of Temperatures* — The measurement of temperatures for the purpose of the temperature variation and temperature differential tests shall commence 2 hours after the oven has been switched on or one hour after the final adjustment of the thermostat, whichever is later.

9.2.4.1 The oven temperature, temperature drift and temperature overshoot shall be measured with a long stem mercury-in-glass thermometer, with the unshielded bulb as near as possible to the centre of the working space. The thermometer shall have a bulb capacity not greater than 0·5 ml, a maximum error not over 0·3°C and the error over any interval of 10°C shall not vary by more than 0·3°C. Separate thermometers conforming with the above requirements may be used at different oven test temperatures if this is found convenient. It shall also be permissible to use a thermocouple, thermistor other compact sensing element with a suitable temperature indicator or recorder provided its response to temperature changes and its accuracy is not inferior to the thermometer described.

9.2.4.2 The temperature variation and temperature differential shall be measured with thermocouples, thermistors or other compact sensing elements capable of measuring temperature differences of 0·1°C at the test temperature and having a response to temperature changes of at least 1 deg/min. For the purpose of measurements, one sensing element shall be placed as near as possible to the centre of the working space and the other successively at the following points:

a) Each of the four upper corners of the working space,

b) Each of the four centres of the four sides of the working space, and

c) Each of the four points vertically above the four lower corners of the working space at a height of 20 mm above the bottom of the working space.

In case of cylindrical ovens the above twelve points shall be substituted by ten points equally distributed on the cylindrical periphery of the working space and two points on the axis of the cylinder one at each end of the working space.

9.2.5 *Arrangement of the Oven* — The oven shall be tested on a table or stand 1 m above floor level and located so as to be protected from direct-heat source or draughts. When carrying out the performance tests, it should have all the shelves, if provided, in position but not loaded; the top ventilation ports should be adjusted according to the manufacturer's instruction accompanying each oven.

9.3 Schedule of Tests — The schedule of type tests to be carried out on the ovens for proving conformity with the requirements of this standard is given in Table 1 with reference to relevant clauses of IS : 302-1973* and this standard.

TABLE 1 SCHEDULE OF TESTS

Sl No.	Test	Clause Reference	
1.	Visual examination and inspection	9.3.1	
2.	Fire-resisting property	29	of IS : 302-1973*
3.	Mechanical strength	36	
4.	Protection against electric shock	40	
5.	High voltage	42.3	
6.	Insulation resistance (dry)	44.3	
7.	Leakage current	42.1 to 42.2	
8.	Earthing connection	38	
9.	Input	45	
10.	Temperature limit	Under consideration	
11.	Temperature variation	9.3.2	
12.	Temperature differential	9.3.3	
13.	Temperature drift	9.3.4	
14.	Reproducibility of temperature setting	9.3.5	
15.	Temperature overshoot	9.3.6	
16.	Ventilation rate (for low temperature ovens and wide range ovens intended for drying)	9.3.7	
17.	Temperature recovery test	Under consideration	
18.	Heating up time		

*General and safety requirements for household and similar electrical appliances (*fourth revision*).

9.3.1 *Visual Examination and Inspection* — Each oven shall be examined and inspected for general construction and marking requirements specified in this standard.

*General and safety requirements for household and similar electrical appliances (*fourth revision*).

9.3.2 *Temperature Variation Test* — With temperature sensing elements located as described in **9.2.4.2** the temperature differences shall be read with reference to the sensing element at the centre of the working space. The temperature variation at each point shall be determined by taking the mean of at least 3 readings of temperature difference at that point. The maximum temperature variation between any two points tested shall not exceed 2 percent of the test temperature of the oven for gravity convection ovens, and 1 percent for forced convection ovens.

9.3.3 *Temperature Differential Test* — With a temperature sensing element located successively at all the different points described in **9.2.4.2**, or a number of sensing elements located simultaneously at all the points described, the temperature at each point shall be recorded continuously or at intervals not exceeding 5 minutes during a 3-hour test period. The temperature differential measured at any point shall not exceed 2 percent of the oven temperature for gravity convection ovens and 1 percent for forced-convection ovens.

9.3.4 *Temperature Drift Test* — With the ovens adjusted as required by **9.2.3**, the oven temperature shall be recorded once every 6 hours with the thermometer described in **9.2.4.1**, for a continuous period of 72 hours. The temperature drift measured above shall not exceed 1·5 percent of the temperature of the test.

9.3.5 *Test for Reproducibility of Temperature Setting* — At the end of the test described in **9.3.4**, when the last temperature reading has been taken, the oven shall be switched off, but left otherwise undisturbed for 24 hours. At the end of this period the oven shall be switched on again for at least 3 hours without altering its temperature setting. At the end of this period the original temperature before switching off shall be regained to within 0·5 percent.

9.3.6 *Temperature Overshoot Test* — In the above test during the initial heating up the temperature shall be recorded at least every 5 minutes when the temperature approaches the original temperature in the test according to **9.3.5** within 5°C, until a steady temperature is attained again. The maximum temperature recorded shall not exceed the steady oven temperature finally obtained by more than 1 percent.

9.3.7 *Ventilation Rate Test* (*Applicable to Low-Temperature Ovens and Wide Range Ovens Designed for Drying*) — The ventilation measured with the oven in operation at 105±5°C, and with the room temperature maintained at 27± 2°C and pressure existing in the laboratory at the time of the test, by the method described in Appendix A or any method giving equally accurate results, shall be not less than 10 changes of air per hour.

NOTE — One change of air signifies the displacement of a volume of air equal to the volume of the total internal space of the heating chamber of the oven.

APPENDIX A

(*Clause* 9.3.7)

METHOD OF MEASUREMENT OF VENTILATION RATE BY MEASURING THE POWER CONSUMPTION

A-1. The rate of ventilation is measured by the additional power required to maintain the oven at the test temperature with its ports open, over that required to maintain the oven at the same temperature with the ports closed. The average power consumption is measured by dividing the total energy consumption indicated by a watthour meter by the total time in hours. In either case the test is started with the initial reading at a cut-in of the thermostat and ended with the final reading at another cut-in of the thermostat, the interval being at least half an hour and as nearly equal as possible in both parts of the test.

A-2. The test is commenced after steady conditions have been reached with the temperature adjusted as required by **9.3.7** and the ventilation ports adjusted according to the instructions supplied with each oven. The average power (x watts) required to maintain the set temperature under these conditions is determined.

A-3. The ventilation ports at the bottom as well as top and the thermometer aperture, door joints, and any other openings are now effectively closed to prevent any leakage of air.

A-4. The oven is run for some time and if necessary adjusted so that the difference between the oven temperature and the room temperature is within 0·2°C of that during the first part of the test, the room temperature being measured at a point 2 m from the oven approximately level with its base, and at least 1 m away from any solid object. The power consumption (y watts) is now measured exactly as in the first part of the test, and for similar period.

A-4.1 The volume of air passing through the oven in the first part of the test is given by the expression:

$$V = \frac{3\,600}{1{\cdot}003\,d} \times \frac{x-y}{t_2-t_1}$$

where

V = volume of air, in litres per hour;

$x-y$ = (*see* **A-2** and **A-4**) the difference in power consumption as determined above in watts;

d = density of air at the ambient temperature and pressure in grams per litre;

t_2 = the oven temperature during the test in deg Celsius; and

t_1 = the ambient temperature during the test in deg Celsius.

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